Site Metering Plan

This plan formalizes the Ames Laboratory Site Metering Plan and defines the responsibilities for implementation

1.0 APPROVAL RECORD

- Reviewed by: Document Control Coordinator (Hiliary Burns)
- Approved by: Manager Facilities and Engineering Services (Doug Hoenig)
- Approved by: Legal Counsel (Barbara Biederman)
- Approved by: Assistant Director, Scientific Planning (Cynthia Jenks)
- Approved by: Chief Research Officer (Duane Johnson)
- Approved by: Chief Operations Officer (Mark Murphy)
- Approved by: Deputy Director (Thomas Lograsso)
- Approved by: Director (Adam Schwartz)

The official approval record for this document is maintained in the Training & Records Management Office, 105 TASF.

2.0 REVISION/REVIEW INFORMATION

The revision description for this document is available from and maintained by the author.

3.0 PURPOSE AND SCOPE

The Energy Policy Act of 2005 (EPAct05) requires "By October 1, 2012, in accordance with guidelines established by the Secretary under paragraph (2), all Federal buildings shall, for the purposes of efficient use of energy and reduction in the cost of electricity used in such buildings, be metered. Each agency shall use, to the maximum extent practicable, advanced meters or advanced metering devices that provide data at least daily and that measure at least hourly consumption of electricity in the Federal buildings of the agency." Further, DOE has directed DOE-owned and contractor-operated sites to develop a Site Metering Plan outlining how this, and future, metering goals will be accomplished. This document is the Site Metering Plan for Ames Laboratory (AL).

4.0 ROLES AND RESPONSIBILITIES

4.1 Manager, Facilities and Engineering Services

Is responsible for oversight of the Ames Laboratory Comprehensive Energy Management Program (CEMP).

4.2 Plant Engineer, Facilities and Engineering Services

Is responsible for collecting and reporting data and monitoring progress toward defined goals.

5.0 PROGRAM INFORMATION

5.1 Introduction Statement

The Ames Laboratory is a Government-owned, Contractor-operated (GOCO) facility located in Ames, Iowa on the campus of Iowa State University (ISU). Ames Laboratory is an Office of Science Laboratory whose mission is to create materials, inspire minds to solve problems, and address global challenges.

The Laboratory has a real property inventory of 13 buildings totaling 340,968 gross square feet. The inventory includes one office building, four research buildings and eight smaller support buildings. Electrical power is purchased from the local municipal utility, steam and chilled water are purchased from ISU and natural gas is purchased from the local utility. In the support of its research in FY2015, Ames Laboratory used 68 billion Site-Delivered Btus of energy at a cost of approximately $1.3 million.

This plan addresses four major areas:

- Meeting Congressional and DOE mandated metering goals.
- Installing and maintaining cost effective metering.
- Collecting, analyzing and storing utility use data.
- Improving electrical energy efficiency.

This plan is a dynamic document and will be reviewed and updated on an annual basis to ensure that metering requirements are being met and specific plans are in place for the next two fiscal years. The level of detail and specific goals identified in this plan are commensurate with the size of the facility and the level of energy consumption as compared to other DOE sites.

The Laboratory is committed to the concept of the installation of cost-effective metering. DOE guidance will be used as the basis for determining where meter installation is cost effective. Actual data and manufacturer's quotes will be used in the determination wherever possible. While DOE recommends the use of Energy Savings Performance Contracts to provide third-party funding, Ames Laboratory has not identified any possibilities for using this for the installation of meters. Therefore meter installations will require the use of General Plant Project (GPP) or operating funds. These expenditures are scrutinized very closely to make sure the Laboratory is a good steward of DOE resources. Because of this, the schedule for installation of meters may be accelerated or delayed, over the short term, based on the availability of funds and the priorities of needs.

5.2 Policy Statement

It is the policy of the Ames Laboratory to conserve energy with the goal of reducing energy use and costs to the lowest cost-effective levels while meeting the mission of the Ames Laboratory.

5.3 Energy Management at Ames Laboratory

5.3.1 Organization

Ames Laboratory does not have a dedicated Energy Management Group; instead, all sustainability efforts receive matrix support from Environment, Safety, Health and Assurance (ESH&A), Facilities and Engineering Services (FES), and Purchasing in conjunction with the Environmental Management System (EMS) oversight committee. FES is responsible for the development, implementation, and coordination of the Site Metering Plan.

5.3.2 Goals

DOE Mandated Goals

- Establish a Site Metering Plan that identifies meters to be installed according to the guidelines of the DOE Metering Plan. This plan fulfills the requirements of this goal, and thus has been met.
- By October 1, 2012, install electrical meters in all buildings using advanced metering where feasible and cost effective. This goal has been met. All appropriate buildings were fitted with advanced electric metering as of April 30, 2010.
- Establish a Power Usage Effectiveness (PUE) target of 1.2 to 1.4 for new data centers and less than 1.5 for existing data centers. The status of this goal is evaluated on an annual basis and for FY 2016 the Laboratory did not meet this goal.
- Meter all individual buildings for electricity, natural gas, steam and water, where cost-effective and appropriate. While all energy used at the Ames Laboratory is metered and reported some utility use is allocated to individual buildings on a square foot basis, specifically:
  - All chilled water is metered at a single point in Metals Development and allocated to TASF, Spedding Hall, Metals Development and Wilhelm Hall based on the percent of total net square footage each building represents.
  - TASF and Spedding Hall share a condensate meter that measures steam use.
  - The Records Storage Building utilities all run through Wilhelm Hall.

EISA 2007 Mandated Goals

- By October 1, 2016, provide for equivalent metering of natural gas and steam. Currently all appropriate buildings at the Ames Laboratory are metered for natural gas and steam utilizing standard metering. The chilled water is metered for the site as a whole; individual buildings are not sub-metered for this utility.

- "The energy manager shall enter energy use data for each metered building that is (or is a part of) a facility that meets the criteria established by the Secretary under paragraph (2)(B) into a building energy use benchmarking system, such as the Energy Star Portfolio Manager." This goal is met; the Plant Engineer enters energy use data into Energy Star Portfolio Manager.

All of the goals identified in this document are intended to help reach one overall objective—to reduce energy use and costs to the lowest cost-effective levels while meeting the mission of the Ames Laboratory.

5.3.3 High Performance Sustainable Building Guiding Principles

Executive Order 13693 requires: "ensuring that at least 15 percent of the agency's existing buildings (above 5,000 gross square feet) and building leases (above 5,000 gross square feet) meet the Revised *Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings*, (Guiding Principles) by fiscal year 2025 and that the agency makes annual progress toward 100-percent conformance with the Guiding Principles for its building inventory."

The Ames Laboratory met the goal of Executive Order 13514 and will be working to achieve the new goals established by Executive Order 13693 and the installation of additional sub-metering will aid in documenting that the requirements of the Revised *Guiding Principles* have been met.

5.3.4 Plan

- It was previously determined that the following Ames Laboratory Buildings required advanced electrical metering:
  - Spedding Hall
  - Wilhelm Hall
  - Metals Development
  - Technical and Administrative Support Facility (TASF)
- Installation of advance electric energy metering was completed in FY 2010.
- Cost estimates have been developed and efforts to identify funding to install sub-metering within the Ames Laboratory campus continue.
- The Sensitive Instrument Facility, which came on-line in FY 2016, was designed and constructed with metering in place for electricity, water and steam condensate. Advanced metering is installed to monitor electrical power. SIF does not use natural gas.
- Collect and evaluate available electric and thermal energy metering data to facilitate identification of opportunities for energy savings.
- Identify additional metering required to continue to monitor the power utilization effectiveness of the primary data center at the Laboratory with the installation of additional computing resources and support equipment.

5.3.5 Plan Strategy

The installation of advanced electrical metering at the Ames Laboratory was a single project that installed the required meters in all of the buildings. Meter technologies, products and vendors have been evaluated and standardized on the Johnson Controls Metasys platform. Electric meter installation was completed in April 2010. Any building level sub-metering of chilled water and/or upgrading of water or steam metering to smart meters will be approached in the same manner.

Currently, the supplier of utilities to the Ames Laboratory has a single advanced meter that monitors chilled water use for the entire site; building sub-metering is not installed. Ames Laboratory is in the process of negotiating access to that meter and the real-time

and trend data it produces.

Installation of chilled water sub-meters is estimated at approximately $35,000 each. Assuming actionable data will be obtained producing a 2% savings in chilled water each year, a simple payback of approximately 20 years is estimated. Currently the sub-meter installations are not considered cost effective.

Natural gas used at the Ames Laboratory accounts for approximately 2.25% of annual energy consumption. Using guidance described in DOE/EE-0312 – *Guidance for Electric Metering in Federal Buildings* and FEMP Document # 2006.100, Rev. 0 – *DOE Buildings Electric Metering Guidance*, September 27, 2006, the installation of smart meters to monitor the use of natural gas at the Ames Laboratory is not cost effective and, therefore, not required.

Monitoring of the data center PUE is a mandated goal. Identification of additional required sub-metering is in progress.

Currently the Laboratory allocates 5% of one Full Time Equivalent (FTE) employee to tracking and reporting utility data and performing in-house energy management.

5.3.6 Tracking Progress

Requirements for advanced metering of utilities other than electricity will necessitate this plan is reviewed at least annually to ensure that Ames Laboratory routinely reviews metering requirements and the status of Laboratory metering in relation to those requirements.

Note that currently all energy utilized by the Ames Laboratory is metered, reviewed, and entered into a local data base as well as Energy Star Portfolio Manager for benchmarking.

5.3.7 FY 2017 Activities

During FY 2017 the Ames Laboratory plans to:

- Continue to trend and analyze meter data to maximize energy and monetary savings.
- Install additional sub-meters for data center.
- Review and update the Metering Plan.
- Complete any outstanding sub-metering as funding allows. Update project scope definitions, outline specifications and cost estimates for the installation of remaining outstanding sub-meters.
- Prepare project estimates for the installation of a condensate sub-meter for TASF.

5.3.8 FY 2018 Activities

During FY 2018 the Ames Laboratory plans to:

- Continue to trend and analyze meter data to maximize energy and monetary savings.
- Review and update the Metering Plan.
- Complete any outstanding sub-metering as funding allows. Update project

scope definitions, outline specifications and cost estimates for the installation of remaining outstanding sub-meters.

5.3.9 FY 2019 and Beyond

Currently the Ames Laboratory Ten-Year Site Plan shows an investment in FY 2023 of GPP funds ($500,000) to address energy and water conservation needs, including installation of additional sub-metering.